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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/797,594	03/10/2004	Yusuke Sakagami	9319A-000724	4710

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EXAMINER
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MRUK, GEOFFREY S

ART UNIT	PAPER NUMBER
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2853

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/30/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/797,594

Applicant(s)

SAKAGAMI ET AL.

Examiner

Geoffrey Mruk

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 27-37 and 39-54 is/are pending in the application.
- 4a) Of the above claim(s) 42-48 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 27-37, 39-41, and 49-54 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 27-40 and 49-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yauchi et al. (US 5,500,657) in view of Girones et al. (US 6,238,112 B1).

With respect to claim 27, Yauchi discloses a droplet ejection apparatus (Fig. 1) having a driving circuit (Fig. 2, element 6), a reciprocating mechanism (Fig. 9, element 53) and a plurality of droplet ejection heads (Fig. 1) each including a cavity (Fig. 1, element 3) filled with a liquid (Fig. 9, element 60), a nozzle (Fig. 1, element 4) in communication with the cavity, an actuator (Fig. 1, element 5), and a diaphragm (Fig. 1, element 2) that is displaced when the actuator is driven, the droplet ejection head ejecting the liquid within the cavity through the nozzle in the form of droplets by driving the actuator by means of the driving circuit to change an internal pressure of the cavity while moving the plurality of droplet ejection heads relatively with respect to a droplet receptor by the reciprocating mechanism so that the ejected droplets land on the droplet receptor (Column 1, lines 9-14), the droplet ejection apparatus comprising:

- ejection failure detecting means (Fig. 8, elements 21-26) for detecting an ejection failure of the droplet ejected through each of the nozzles and causes thereof

(Column 6, lines 31-65), the causes of the ejection failure detection means can detect including: intrusion of an air bubble into the cavity (Column 5, line 63 – Column 6, line 12),

- wherein the ejection failure detecting means being constructed to detect a residual vibration of the diaphragm (Column 4, lines 53-55 and Column 5, lines 63-64, i.e. elements 2 and 5 are fixed and action/reaction of element 5) and the determine an ejection failure and a cause thereof based on a pattern of the detected residual vibration of the diaphragm (Fig. 3, elements a-f);
- counting means (Fig. 8, element 45) for counting the number of ejection failures detected by the ejection failure detecting means (Column 11, lines 16-26);
- recovery means (Column 11, lines 1-10; Column 11, lines 46-50) for carrying out recovery processing for the droplet ejection heads to eliminate the cause of the ejection failure of the droplet;
- wherein the ejection failure detecting means (Fig. 8, elements 21-26) detects the ejection failure with respect to a droplet ejection operation of each droplet ejected through the nozzles when the plurality of droplet ejection heads eject the droplets onto the droplet receptor (Column 10, lines 56-60), and
- wherein, in the case where the number of ejection failures (Column 11, lines 16-25) with respect to the droplet receptor counted by the counting means exceeds (Column 11, lines 46-50) a predetermined reference value (Fig. 8, element 41, i.e.  $41 = 0$ , Column 11, lines 31-32), the droplet ejection apparatus interrupts the ejection of the droplets onto the droplet receptor and make the recovery means

carry out the recovery processing in accordance with the cause of the ejection failure (Fig. 8, element 41, i.e. 45 = True, Column 11, lines 42-43).

With respect to claim 28, Yauchi discloses the reference value is changeable (Column 11, line 30, i.e. reset).

With respect to claim 29, Yauchi discloses the droplet ejection apparatus has a plurality of operation modes that respectively correspond to reference values different from each other, and is adapted to be able to select any one of the operation modes (Column 11, lines 46-50, i.e. printing or discontinued printing).

With respect to claim 30, Yauchi discloses the droplet ejection apparatus is adapted to confirm whether or not the ejection failure is eliminated through a detecting operation by the ejection failure detecting means after the recovery means carried out the recovery processing in accordance with the cause of the ejection failure (Fig. 11; Column 13, lines 10-59).

With respect to claim 31, Yauchi discloses the detecting operation by the ejection failure detecting means for the confirmation is carried out at a droplet ejection operation in a flushing process for the nozzle (Fig. 11; Column 13, lines 10-59).

With respect to claim 32, Yauchi discloses the droplet ejection apparatus resumes the remaining ejection operation of the droplets onto the droplet receptor after carrying out the detecting operation by the ejection failure detecting means for the confirmation (Fig. 11; Column 13, lines 10-59).

With respect to claim 33, Yauchi discloses droplet receptor transporting means (Fig. 9), which carries out discharge and feed of the droplet receptor (Column 10, lines 56-60);

- wherein the droplet ejection apparatus is adapted to operate the droplet receptor transporting means to discharge the droplet receptor from and feed another droplet receptor to the droplet ejection apparatus to carry out a new and same droplet ejection operation with respect to the fed droplet receptor after carrying out the detecting operation by the ejection failure detecting means for the confirmation (Column 11, lines 46-50).

With respect to claim 34, Yauchi discloses in the case where the ejection failure is detected through the detecting operation by the ejection failure detecting means for the confirmation, the recovery means carries out the recovery processing again (Column 3, lines 20-30).

With respect to claim 35, Yauchi discloses in the case where the recovery means carries out the recovery processing again when the ejection failure was detected through the detecting operation by the ejection failure detecting means for the confirmation, the recovery means carries out the recovery processing in accordance with the cause of the ejection failure (Column 33-45).

With respect to claim 36, Yauchi discloses the recovery means includes (Fig. 11): flushing means for carrying out a flushing process (Fig. 10, element 80) by which the droplets are preliminarily ejected through the nozzles by driving the actuator; and pumping means (Fig. 10, element 81) for carrying out a pump-suction process with the

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use of a pump connected to a cap that covers the nozzle surface of the droplet ejection heads (Column 12, lines 37-61).

With respect to claim 37, Yauchi discloses the causes of the ejection failure that the ejection failure detecting means can detect include: intrusion of an air bubble into the cavity (Column 2, lines 18-22); and wherein the recovery means carries out the pump-suction process by the pumping means in case of the intrusion of an air bubble (Fig. 10; Column 12, lines 37-61).

With respect to claim 39, Yauchi discloses the ejection failure detecting means includes judging (Fig. 8, element 25) means for judging a cause of the ejection failure in the case where it is determined that there is the ejection failure of the droplets in the droplet ejection heads (Fig. 8, element 5) on the basis of the vibration pattern of the residual vibration of the diaphragm (Fig. 3a-3f).

With respect to claim 40, Yauchi discloses the vibration pattern of the residual vibration of the diaphragm (Fig. 1, element 2) includes a cycle of the residual vibration (Fig. 3a-3f).

With respect to claim 49, Yauchi discloses switching means (Fig. 8, element 23) for switching a connection of the actuator from the driving circuit to the ejection failure detecting means after carrying out the droplet ejection operation by driving the actuator (Column 6, lines 31-54).

With respect to claim 50, Yauchi discloses one or more ejection failure detecting means and one or more switching means (Fig. 8, elements 12 and 20);

- wherein the switching means corresponding to the droplet ejection head that has carried out the droplet ejection operation switches the connection of the actuator from the driving circuit to the corresponding ejection failure detecting means, and then the switched ejection failure detecting means detects an ejection failure of the droplets (Column 10, lines 56-60; Column 11, lines 46-50).

With respect to claim 51, Yauchi discloses the actuator includes an electrostatic actuator (Fig. 1, element 5; piezoelectric actuators are electrostatic).

With respect to claim 52, Yauchi discloses the actuator includes a piezoelectric actuator (Fig. 1, element 5) having a piezoelectric element and using a piezoelectric effect of the piezoelectric element.

With respect to claim 53, Yauchi discloses storage means (Column 10, lines 58-60) for storing a cause of the ejection failure of the droplets detected by the ejection failure detecting means in association with the nozzle for which the detection was carried out.

With respect to claim 54, Yauchi discloses the droplet ejection apparatus includes an ink jet printer (Fig. 9; Column 1, lines 9-14).

However, with respect to claims 27, 36, and 37, Yauchi fails to disclose:

- thickening of the liquid in the vicinity of the nozzle due to drying; and adhesion of paper dust in the vicinity of an outlet of the nozzle;
- wiping means for carrying out a wiping process in which a nozzle surface of the droplet ejection heads where the nozzles are arranged is wiped with a wiper



- the flushing process by the flushing means or the pump-suction process by the pumping means in case of the thickening of the liquid due to drying, and at least the wiping process by the wiper in case of the adhesion of paper dust.

Girones discloses an inkjet printing system (Fig. 1) where "The orifice plate of the printhead, tends to pick up contaminants, such as paper dust, and the like, during the printing process. Such contaminants adhere to the orifice plate either because of the presence of ink on the printhead, or because of electrostatic charges. In addition, excess dried ink can accumulate around the printhead. The accumulation of either ink or other contaminants can impair the quality of the output by interfering with the proper application of ink to the printing medium" (Column 1, line 64 – Column 2, line 5) and a cleaner service station (Fig. 2). Furthermore, Girones discloses "In step 810, the identifying numbers of nozzles which are found not to function correctly during drop detection which are also known as "bad" nozzles are stored in a memory device. In step 815, if the number of bad nozzles is greater than a threshold number then in step 820 the printer device performs an automatic printhead intervention. Performing automatic printhead intervention 820 may comprise increased cleaning of the bad nozzles in an attempt to recover them. In addition, step 820 may further comprise steps generating error hiding information by which, during a print operation, good nozzles are re-used to spray a predetermined sequence of ink droplets in the place of non-functioning nozzles thereby improving print quality" (Column 14, lines 31-39).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the cleaner service station disclosed by Girones in the inkjet recording system

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disclosed by Yauchi. The motivation for doing so would have been "The concepts disclosed herein for cleaning the printheads 60-66 apply equally to the totally replaceable inkjet cartridges, as well as to the illustrated off-axis semi-permanent or permanent printheads, although the greatest benefits of the illustrated system may be realized in an off-axis system where extended printhead life is particularly desirable" (Column 7, lines 22-27).

2. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yauchi et al. (US 5,500,657) in view of Girones et al. (US 6,238,112 B1) as applied to claim 40 above, and further in view of Isayama (US 4,034,380).

With respect to claim 41, Yauchi discloses the judging means (Fig. 8, element 25) judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle (Column 6, lines 3-14).

However, Yauchi fails to disclose:

- the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and
- paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold.

Isayama discloses an ink ejection apparatus for a printer where "A circuit is shown in FIG. 2 for extracting the oscillating component of the voltage across the plate 20,

comparing the magnitude of the oscillating component with a predetermined value and producing an electrical signal when the magnitude of the oscillating component is above the predetermined value" (Column 3, lines 3-8) and the resulting curves (Fig. 6a-6c)

At the time of the invention, it would have been obvious to use the curves disclosed by Isayama for the detection apparatus disclosed by Yauchi. The motivation for doing so would have been "to provide an ink ejection apparatus comprising means for detecting a lack of ink or air bubbles in an ink chamber thereof" (Column 1, lines 37-40).

### ***Response to Arguments***

Applicant's arguments with respect to claim 27 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey Mruk whose telephone number is 571 272-2810. The examiner can normally be reached on 7am - 330pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on 571 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GSM  
3/24/2007



**STEPHEN MEIER**  
**SUPERVISORY PATENT EXAMINER**